

General

Title

Diagnostic imaging: percentage of final reports for carotid imaging studies (neck MRA, neck CTA, neck duplex ultrasound, carotid angiogram) performed that include direct or indirect reference to measurements of distal internal carotid diameter as the denominator for stenosis measurement.

Source(s)

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Process

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of final reports for carotid imaging studies (neck magnetic resonance angiography [MRA], neck computerized tomographic angiography [CTA], neck duplex ultrasound, carotid angiogram) performed that include direct or indirect reference to measurements of distal internal carotid diameter as the denominator for stenosis measurement.

Rationale

Accurate assessment of the degree of carotid artery stenosis is essential to guiding proper treatment decisions for patients with carotid artery disease. Trials have demonstrated the ability of the degree of carotid artery stenosis to predict which patients will receive the greatest benefit from surgical intervention ("Beneficial effect," 1991; Mayberg et al., 1991; Hobson et al., 1993; Executive Committee

for the Asymptomatic Carotid Atherosclerosis Study, 1995). To ensure accurate assessment of stenosis, it is important to use a standardized validated approach. Rothwell et al. demonstrated significant differences between measurements of stenosis made using different methods of measurement (Rothwell et al., "Equivalence of measurements," 1994; Rothwell et al., "Prognostic value," 1994).

The following evidence statements are quoted verbatim from the referenced clinical guidelines and other references:

The panel recommended that the North American Symptomatic Carotid Endarterectomy Trial (NASCET) method of calculating stenosis measurement should be used when angiography is used to correlate ultrasound (US) findings (Grant et al., 2003).

When magnetic resonance angiography (MRA) techniques are used for determining carotid stenosis, the report should reflect the methodology and reference the criteria for percent stenosis outlined in the NASCET. Also, the percent stenosis must be calculated using the distal cervical internal carotid artery (ICA) diameter, where the walls are parallel, for the denominator. Similar to computerized tomographic angiography (CTA), MRA with attention to the acquisition parameters and post-processing techniques can provide cross sectional measurements of stenosis that correlate with properly performed NASCET estimates of percent stenosis obtained with catheter angiography. In the setting of near occlusion, it may not be accurate to calculate percent stenosis ratios in the presence of post-stenotic arterial diameter decrease. Some MRA techniques may not be amenable to quantitative measurements, in which case qualitative measurements of stenosis should be provided (American College of Radiology [ACR] et al., 2010).

Evidence for Rationale

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

American College of Radiology (ACR), American Society of Neuroradiology (ASNR), Society of NeuroInterventional Surgery (SNIS), Society for Pediatric Radiology (SPR). ACR-ASNR-SNIS-SPR practice guideline for the performance of pediatric and adult cervicocerebral magnetic resonance angiography (MRA). Reston (VA): American College of Radiology (ACR); 2010. 8 p. [39 references]

Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis. North American Symptomatic Carotid Endarterectomy Trial Collaborators. N Engl J Med. 1991 Aug 15;325(7):445-53. [PubMed](#)

Executive Committee for the Asymptomatic Carotid Atherosclerosis Study. Endarterectomy for asymptomatic carotid artery stenosis. JAMA. 1995 May 10;273(18):1421-8. [PubMed](#)

Grant EG, Benson CB, Moneta GL, Alexandrov AV, Baker JD, Bluth EI, Carroll BA, Eliasziw M, Gocke J, Hertzberg BS, Katanick S, Needleman L, Pellerito J, Polak JF, Rholl KS, Wooster DL, Zierler RE. Carotid artery stenosis: gray-scale and Doppler US diagnosis--Society of Radiologists in Ultrasound Consensus Conference. Radiology. 2003 Nov;229(2):340-6. [40 references] [PubMed](#)

Hobson RW 2d, Weiss DG, Fields WS, Goldstone J, Moore WS, Towne JB, Wright CB. Efficacy of carotid endarterectomy for asymptomatic carotid stenosis. The Veterans Affairs Cooperative Study Group. N Engl J Med. 1993 Jan 28;328(4):221-7. [PubMed](#)

Mayberg MR, Wilson SE, Yatsu F, Weiss DG, Messina L, Hershey LA, Colling C, Eskridge J, Deykin D, Winn HR. Carotid endarterectomy and prevention of cerebral ischemia in symptomatic carotid stenosis. Veterans Affairs Cooperative Studies Program 309 Trialist Group. JAMA. 1991 Dec 18;266(23):3289-94.

Rothwell PM, Gibson RJ, Slattery J, Sellar RJ, Warlow CP. Equivalence of measurements of carotid stenosis. A comparison of three methods on 1001 angiograms. European Carotid Surgery Trialists' Collaborative Group. Stroke. 1994 Dec;25(12):2435-9. [PubMed](#)

Rothwell PM, Gibson RJ, Slattery J, Warlow CP. Prognostic value and reproducibility of measurements of carotid stenosis. A comparison of three methods on 1001 angiograms. European Carotid Surgery Trialists' Collaborative Group. Stroke. 1994 Dec;25(12):2440-4. [PubMed](#)

Primary Health Components

Carotid imaging studies; neck magnetic resonance angiography (MRA); neck computerized tomographic angiography (CTA); neck duplex ultrasound; carotid angiogram; stenosis measurement; distal internal carotid diameter

Denominator Description

All final reports for carotid imaging studies (neck magnetic resonance angiography [MRA], neck computerized tomographic angiography [CTA], neck duplex ultrasound, carotid angiogram) performed

Numerator Description

Final reports for carotid imaging studies that include direct or indirect reference to measurements of distal internal carotid diameter as the denominator for stenosis measurement (see the related "Numerator Inclusions/Exclusions" field)

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

A clinical practice guideline or other peer-reviewed synthesis of the clinical research evidence

A formal consensus procedure, involving experts in relevant clinical, methodological, public health and organizational sciences

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Importance of Topic

As imaging technology continues to advance, the United States healthcare system has seen an increase in both the type and frequency of imaging studies being performed. The increase in utilization of imaging studies is accompanied by a corresponding increase in cost and exposure to radiation for both patients and healthcare professionals.

From 1980 to 2006, the number of radiologic procedures performed in the United States showed a ten-fold increase while the annual per-capita effective dose from radiologic and nuclear medicine procedures increased by 600% (Mettler et al., 2009).

From 1996 to 2010, the number of computerized tomographic (CT) examinations tripled, while the number of ultrasounds nearly doubled (Smith-Bindman et al., 2012).

From 1996 to 2010, advanced diagnostic imaging (i.e., CT, magnetic resonance imaging [MRI], nuclear medicine, and ultrasound) accounted for approximately 35% of all imaging studies (Smith-Bindman et al., 2012).

From 1980 to 2006, the proportion of radiation exposure that is attributable to medical sources increased from 17% to 53% (Mettler et al., 2009).

In 2006, while CT scans only accounted for approximately 17% of all radiologic procedures performed in the United States, they accounted for over 65% of the total effective radiation dose from radiologic procedures (Mettler et al., 2009).

In 2006, the estimated per-capita effective radiation dose for radiologic procedures in the United States was nearly 20% higher than the average for other well-developed countries (Mettler et al., 2009).

Diagnostic imaging was prioritized as a topic area for measure development due to a high level of utilization, rising costs, and the need for measures to help promote appropriate use of imaging and improve outcomes.

Opportunity for Improvement

There is wide variance in how stenosis is currently documented and reported. A 2013 study by Cheng et al. of 127 Veteran's Affairs medical centers found inconsistency in the method of reporting as well as which clinical thresholds were used to determine severity of stenosis. In addition, Giurgea et al. (2012) demonstrated significant differences in classification of carotid stenosis among different clinical settings.

Evidence for Additional Information Supporting Need for the Measure

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPIA®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

Cheng EM, Bravata DM, El-Saden S, Vassar SD, Ofner S, Williams LS, Keyhani S. Carotid artery stenosis: wide variability in reporting formats--a review of 127 Veterans Affairs medical centers. *Radiology*. 2013 Jan;266(1):289-94. [PubMed](#)

Giurgea GA, Lilaj I, Gschwandtner ME, Margeta C, Zehetmayer S, Domenig C, Schlager O, Schwameis M, Koppensteiner R, Willfort-Ehringer A. Poor agreement in carotid artery stenosis detection by ultrasound between external offices and a vascular center. *Wiener Klinische Wochenschrift*. 2012 Nov;124(21-22):769-74. [PubMed](#)

Mettler FA, Bhargavan M, Faulkner K, Gilley DB, Gray JE, Ibbott GS, Lipoti JA, Mahesh M, McCrohan JL, Stabin MG, Thomadsen BR, Yoshizumi TT. Radiologic and nuclear medicine studies in the United States and worldwide: frequency, radiation dose, and comparison with other radiation sources--1950-2007. *Radiology*. 2009 Nov;253(2):520-31. [PubMed](#)

Smith-Bindman R, Miglioretti DL, Johnson E, Lee C, Feigelson HS, Flynn M, Greenlee RT, Kruger RL, Hornbrook MC, Roblin D, Solberg LI, Vanneman N, Weinmann S, Williams AE. Use of diagnostic imaging studies and associated radiation exposure for patients enrolled in large integrated health care systems, 1996-2010. *JAMA*. 2012 Jun 13;307(22):2400-9. [PubMed](#)

Extent of Measure Testing

The American Medical Association (AMA)-convened Physician Consortium for Performance Improvement (PCPI) collaborated on a measure testing project in 2011 with Telligen to ensure four radiology measures were reliable and evaluated for accuracy of the measure numerator, denominator, and exception case identification. The testing project was conducted utilizing electronic health record data and claims data.

Inter-rater reliability was tested. Three sites in three states participated in the testing of the measures. All three sites were in urban settings. Site A was a group practice with 10 physicians. Site B was a hospital-based group practice with 90 physicians. Site C was a hospital-based practice with greater than 1000 physicians.

Reliability Testing

The purpose of reliability testing was to evaluate whether the measure definitions and specifications, as prepared by the PCPI, yield stable, consistent measures. Data abstracted from chart records were used to calculate inter-rater reliability for the measures.

Some of the measures in this set are being made available without any prior testing. The PCPI recognizes the importance of testing all of its measures and encourages testing of the diagnostic imaging measurement set for feasibility and reliability by organizations or individuals positioned to do so. The *Measure Testing Protocol for PCPI Measures* was approved by the PCPI in 2010 and is available on the PCPI Web site (see Position Papers at www.physicianconsortium.org); interested parties are encouraged to review this document and to contact PCPI staff. The PCPI will welcome any opportunity to promote the initial testing of these measures and to ensure that any results available from testing are used to refine the measures before implementation.

Evidence for Extent of Measure Testing

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPI®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Ambulatory/Office-based Care

Ambulatory Procedure/Imaging Center

Hospital Inpatient

Hospital Outpatient

Long-term Care Facilities - Other

Skilled Nursing Facilities/Nursing Homes

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Individual Clinicians or Public Health Professionals

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Unspecified

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Prevention and Treatment of Leading Causes of Mortality

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Data Collection for the Measure

Case Finding Period

Case Finding Period

Unspecified

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Diagnostic Evaluation

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions

All final reports for carotid imaging studies (neck magnetic resonance angiography [MRA], neck computerized tomographic angiography [CTA], neck duplex ultrasound, carotid angiogram) performed

Exclusions

Unspecified

Exceptions

None

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions

Final reports for carotid imaging studies that include direct or indirect reference to measurements of distal internal carotid diameter as the denominator for stenosis measurement

Note:

Direct or Indirect Reference to Measurements of Distal Internal Carotid Diameter as the Denominator for Stenosis Measurement: Includes direct angiographic stenosis calculation based on the distal lumen as the denominator for stenosis measurement OR an equivalent validated method referenced to the above method (e.g., for duplex ultrasound studies, velocity parameters that correlate with anatomic measurements that use the distal internal carotid lumen as the denominator for stenosis measurement)

Numerator Instructions: This measure requires that the estimate of stenosis included in the report of the imaging study employ a method such as the North American Symptomatic Carotid Endarterectomy Trial (NASCET) method for calculating the degree of stenosis. The NASCET method calculates the degree of stenosis with reference to the lumen of the carotid artery distal to the stenosis. For duplex imaging studies the reference is indirect, since the degree of stenosis is inferred from velocity parameters and cross referenced to published or self-generated correlations among velocity parameters and results of angiography or other imaging studies which serve as the gold standard. In Doppler ultrasound, the degree of stenosis can be estimated using Doppler parameter of the peak systolic velocity (PSV) of the internal carotid artery (ICA), with concordance of the degree of narrowing of the ICA lumen. Additional Doppler parameters of ICA-to-common carotid artery (CCA) PSV ratio and ICA end-diastolic velocity (EDV) can be used when degree of stenosis is uncertain from ICA PSV.

Documentation: Information populating the final report may reside in a dedicated field in the electronic health record (EHR) or picture archiving and communication system (PACS), however stenosis measurement information should be included in the final report in order to be readily accessible in all circumstances.

Refer to the original measure documentation for additional information.

Exclusions

Unspecified

Numerator Search Strategy

Fixed time period or point in time

Data Source

Administrative clinical data

Electronic health/medical record

Imaging data

Paper medical record

Registry data

Type of Health State

Does not apply to this measure

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a higher score

Allowance for Patient or Population Factors

not defined yet

Standard of Comparison

not defined yet

Identifying Information

Original Title

Measure #1: stenosis measurement in carotid imaging reports.

Measure Collection Name

Diagnostic Imaging Performance Measurement Set

Submitter

American College of Radiology - Medical Specialty Society

Developer

American College of Radiology - Medical Specialty Society

National Committee for Quality Assurance - Health Care Accreditation Organization

Physician Consortium for Performance Improvement® - Clinical Specialty Collaboration

Funding Source(s)

Unspecified

Composition of the Group that Developed the Measure

Diagnostic Imaging Measure Development Work Group Members

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Robert Rosenberg, MD (diagnostic radiology)
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Gary Schultz, DC, DACR (chiropractic)
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National Committee for Quality Assurance: Mary Barton, MD

Financial Disclosures/Other Potential Conflicts of Interest

None of the members of the Diagnostic Imaging Work Group had any disqualifying material interest under the Physician Consortium for Performance Improvement (PCPI) Conflict of Interest Policy.

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2014 Dec 16

Measure Initiative(s)

Physician Quality Reporting System

Adaptation

This measure was adapted from the following source:

Stroke and Stroke Rehabilitation Physician Consortium for Performance Improvement Measurement Set - Measure #7: Carotid Imaging Reports. American Academy of Neurology/American College of Radiology/Physician Consortium for Performance Improvement®/National Committee for Quality Assurance; September 2006.

Date of Most Current Version in NQMC

2015 Feb

Measure Maintenance

This measure is reviewed and updated every 3 years.

Date of Next Anticipated Revision

2018

Measure Status

This is the current release of the measure.

This measure updates a previous version: American College of Radiology, Physician Consortium for Performance Improvement®, National Committee for Quality Assurance. Radiology physician performance measurement set. Chicago (IL): American Medical Association (AMA); 2010 Sep. 45 p.

Measure Availability

Source available from the [American College of Radiology \(ACR\) Web site](#) .

For more information, contact ACR at 1891 Preston White Drive, Reston, VA 20191; Phone: 703-648-8900; E-mail: info@acr.org; Web site: www.acr.org .

NQMC Status

This NQMC summary was completed by ECRI Institute on February 1, 2008. The information was verified by the measure developer on April 10, 2008.

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This NQMC summary was edited by ECRI Institute on April 27, 2012.

Stewardship for this measure was transferred from the PCPI to the ACR. ACR informed NQMC that this measure was updated. This NQMC summary was updated again by ECRI Institute on October 13, 2015. The information was verified by the measure developer on November 19, 2015.

Copyright Statement

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Production

Source(s)

American College of Radiology (ACR), American Medical Association-convened Physician Consortium for Performance Improvement® (PCPI®), National Committee for Quality Assurance (NCQA). Diagnostic imaging performance measurement set. Reston (VA): American College of Radiology (ACR); 2015 Feb. 58 p. [89 references]

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